

In the Claims

Cancel claims 1-39.

Amend claim 40, as follows:

Sub B1
A1

40. (amended) A microelectronic device structure including a top electrode layer on a surface of a ferroelectric or high ε film material, wherein the ferroelectric or high ε film material at said surface and [in the vicinity thereof is substantially stoichiometrically complete in oxygen concentration] at a depth from said surface that is less than 25 Angstroms has an atomic composition of oxygen and constituent metals that are related in whole integer proportions to one another.

REMARKSCancellation of Claims 1-39

Applicants hereby affirm the prior provisional election of claims 40-50.

Consistent with such affirmation, and the Examiner's withdrawal of claims 1-39 from consideration, claims 1-39 have been cancelled herein.

Such cancellation of claims is with express reservation of the right to file a continuation application directed to the subject matter of such allowed claims during the pendency of the present application or a further continuation or divisional application based on and claiming priority of the present application.

Amendment of Claim 40

In response to the rejection of claims 40-50 on §112 grounds, claim 40 has been amended herein to recite the microelectronic device structure of the claimed invention as including a top electrode layer on a surface of a ferroelectric or high ϵ film material, thereby overcoming the basis for rejection of the claims.

In addition, claim 40 has been amended to further quantitatively specify, consistent with the description of the invention at page 8, lines 1-7 of the specification, that at a depth from said surface that is less than 25 Angstroms has an atomic composition of oxygen and constituent metals that are related in whole integer proportions to one another.

Rejection of Claims in the April 21, 2000 Office Action, and Traversal Thereof

In the April 21, 2000 Office Action, claims 40-50 have been rejected, including:

a rejection of claims 40-44 on §102(e) grounds as anticipated by Aoyama et al.;
a rejection of claims 45-50 on §103(a) grounds as unpatentable over Aoyama et al.;
a rejection of claims 40-44 and 46-50 on §102(e) grounds as anticipated by Nishioka; and
a rejection of claim 45 on §103(a) grounds as unpatentable over Nishioka.

These rejections of the claims are traversed and reconsideration of the patentability of the claims as amended/added herein is requested in light of the following remarks.

Patentability Distinction of the Claims Over the Cited Art

Under the conditions taught to be employed by Aoyama et al. and Nishioka for top electrode deposition, **the ferroelectric surface is readily reducible and it is not inherently stoichiometric.**

Sputtering and CVD processes are noted as possible top electrode deposition processes in Aoyama et al. U.S. Patent 5,852,307. In these approaches either Ru atoms or a Ru precursor molecule is oxidized on the ferroelectric surface during the deposition of the first monolayer of electrode. **This is an inherently reducing atmosphere for the ferroelectric.** The extent to which the ferroelectric surface is reduced will be governed by the relative rates of Ru oxidation by the deposition process oxygen partial pressure immediately above the growth surface and the rate of Ru oxidation by reaction with oxygen from the ferroelectric (i.e. reduction of the ferroelectric).

Once the surface is reduced it can be partially oxidized by diffusion of oxygen through the top electrode. This is commonly practiced in the case of Pt top electrodes due to the facile diffusion of oxygen through Pt and does result in improvement in capacitor properties. This is the approach described in Nishioka U.S. Patent 5,973,911. **In practice, however, capacitor properties cannot be fully recovered by this approach.** This is likely due to the reduced driving force for oxygen diffusion as the ferroelectric approaches stoichiometry.

Accordingly, neither Aoyama et al. or Nishioka teaches or suggests the formation of a ferroelectric or high ϵ film that at a depth from its surface is less than 25 Angstroms has an

atomic composition of oxygen and constituent metals that are related in whole integer proportions to one another.

CONCLUSION

Claims 40-51 are patentably distinguished over the art and of allowable form. Favorable action is merited.

Respectfully submitted,



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